

Astrophysics: Low Mach Number Flows

Objective: Develop new low Mach number approach to study x-ray bursts (XRBs) and convection preceding ignition in Type Ia supernovae.

Implications: Will help us confront one of the greatest mysteries in high-energy physics and astronomy today -- the nature of dark energy.

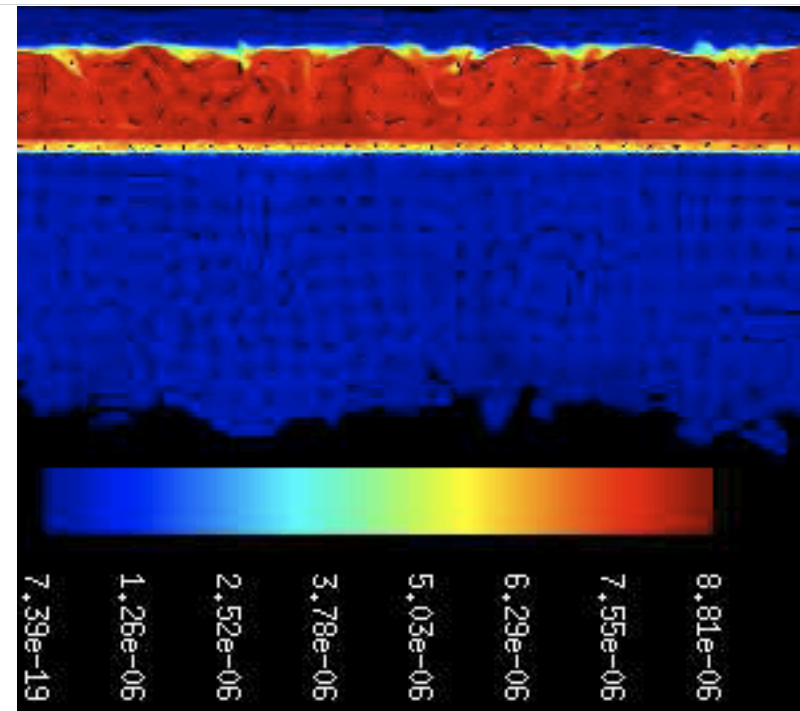
Accomplishments: Implemented MAESTRO 3D hydro code for accurately, efficiently studying low-speed astrophysical flows with nuclear burn.

- MAESTRO with adaptive mesh refinement can calculate XRBs and model full stars in 3D, show how Type Ia supernovae ignite.
- Can now model low-speed astrophysical flows that are beyond the computational scope of existing compressible methods

NERSC:

- 2M hours in 2009; MAESTRO used for NERSC6 benchmarking, NERSC performance studies

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Carbon mass fraction over-plotted with velocity vectors after 22 ms of evolution for X-Ray burst convection in a 10-km neutron star using MAESTRO.

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